Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supplementary Information for

2D-ice templated titanium oxide films as advanced conducting platforms for electrical stimulation

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SEM CHARACTERIZATION

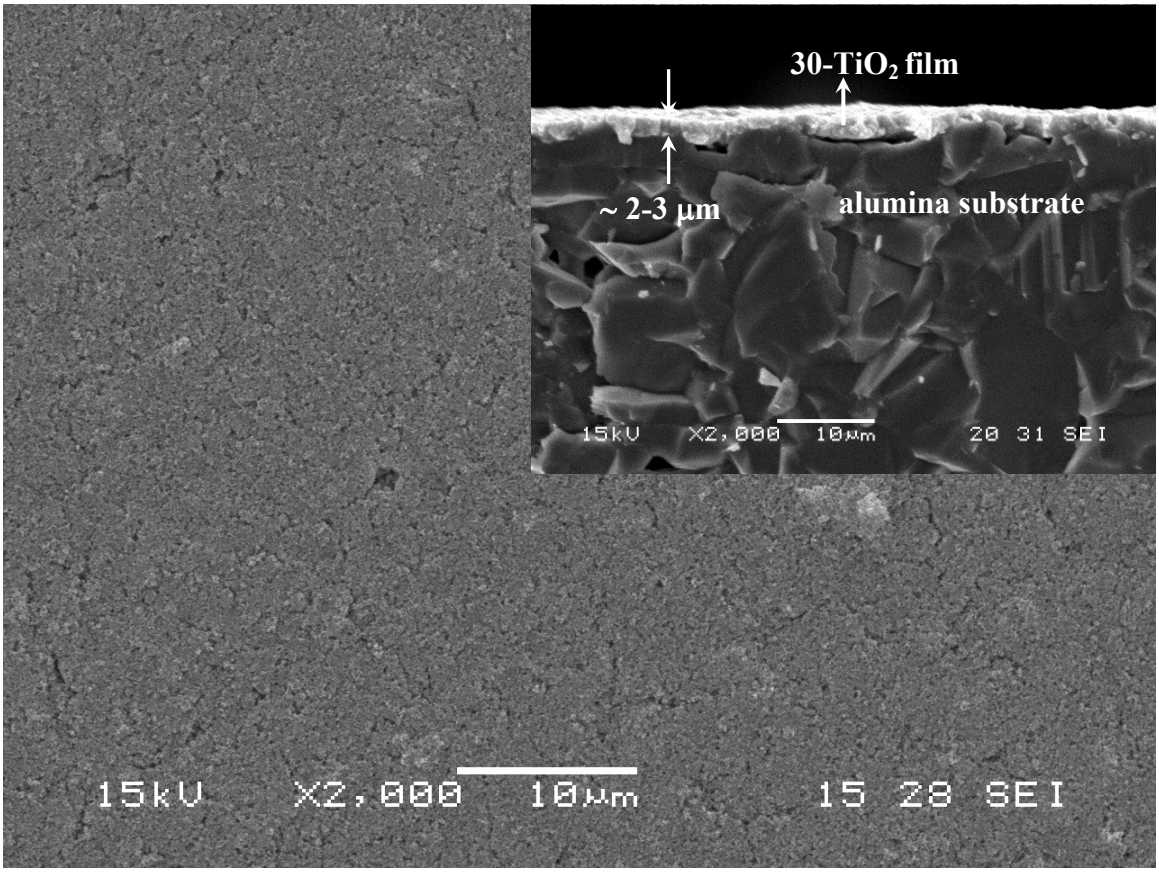

Figure S1: 30-TiO_2 homogeneous film, sintered at 1000 ºC for 1.5 h. Non-patterned surfaces were observed. Measured film thickness was ~ 2-3 μm.

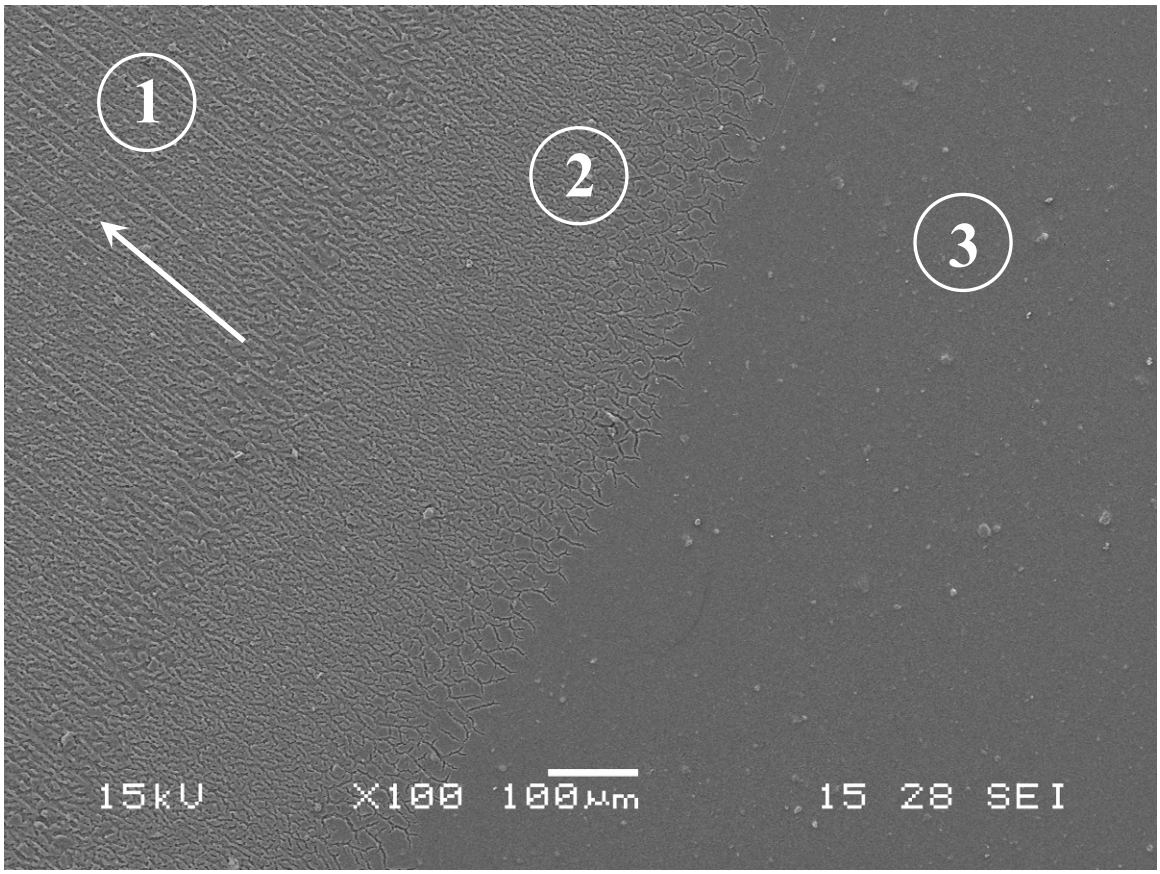

Figure S2: 15-TiO_2 film, sintered at 1000 ºC for 1.5 h. **Region 1** corresponds to the furthest end of the TiO_2 film with respect to the cooling liquid surface. This region is composed of highly aligned grooves along the freezing direction (arrow) and it is preceded by a transitional region (**region 2**, neither ordered nor disordered) which links to a homogeneous non-oriented topology (**region 3**).

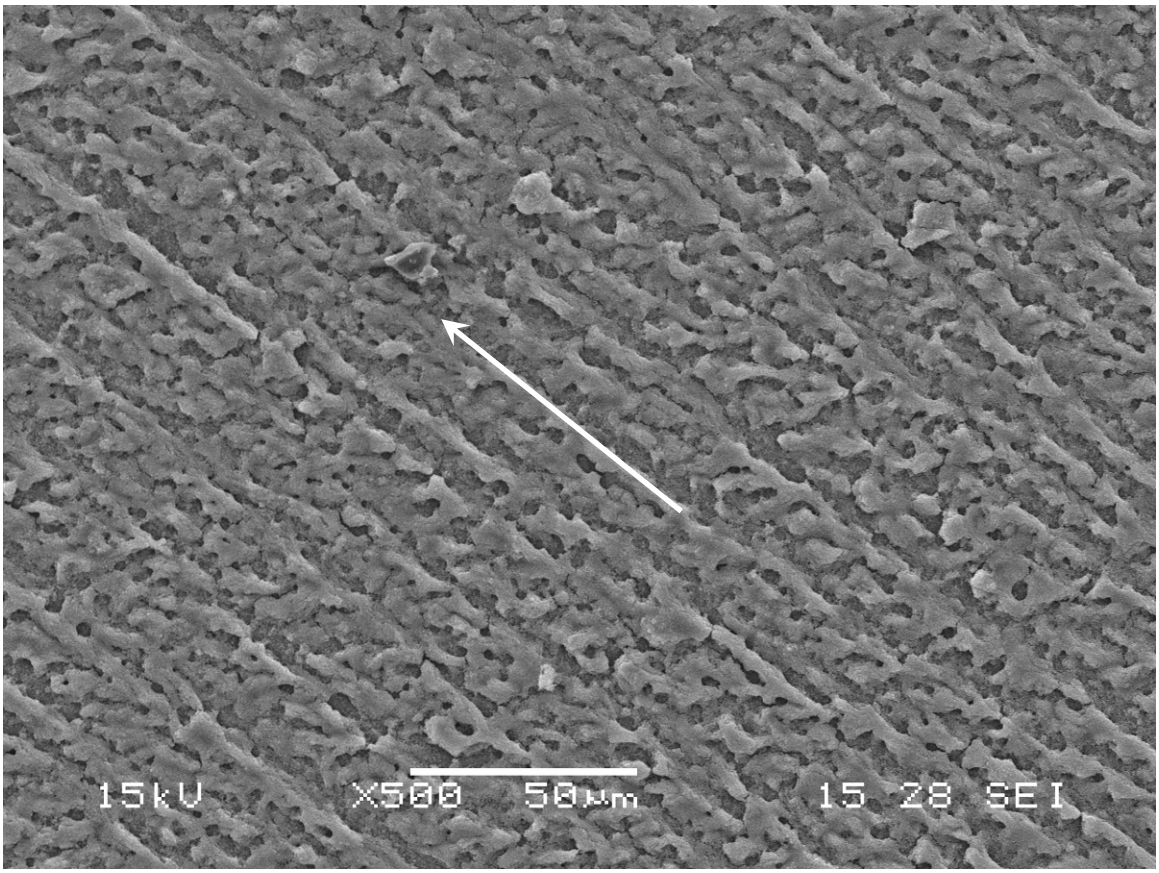

Figure S3: 5-TiO_2 film, sintered at 1000 ºC for 1.5 h. Highly oriented parallel patterns extending throughout the whole surface were observed. Arrow indicates the freezing direction. A ´fish-bone` morphology (typically observed for 3D-ceramic assemblies processed by directional freezing), was evidenced.

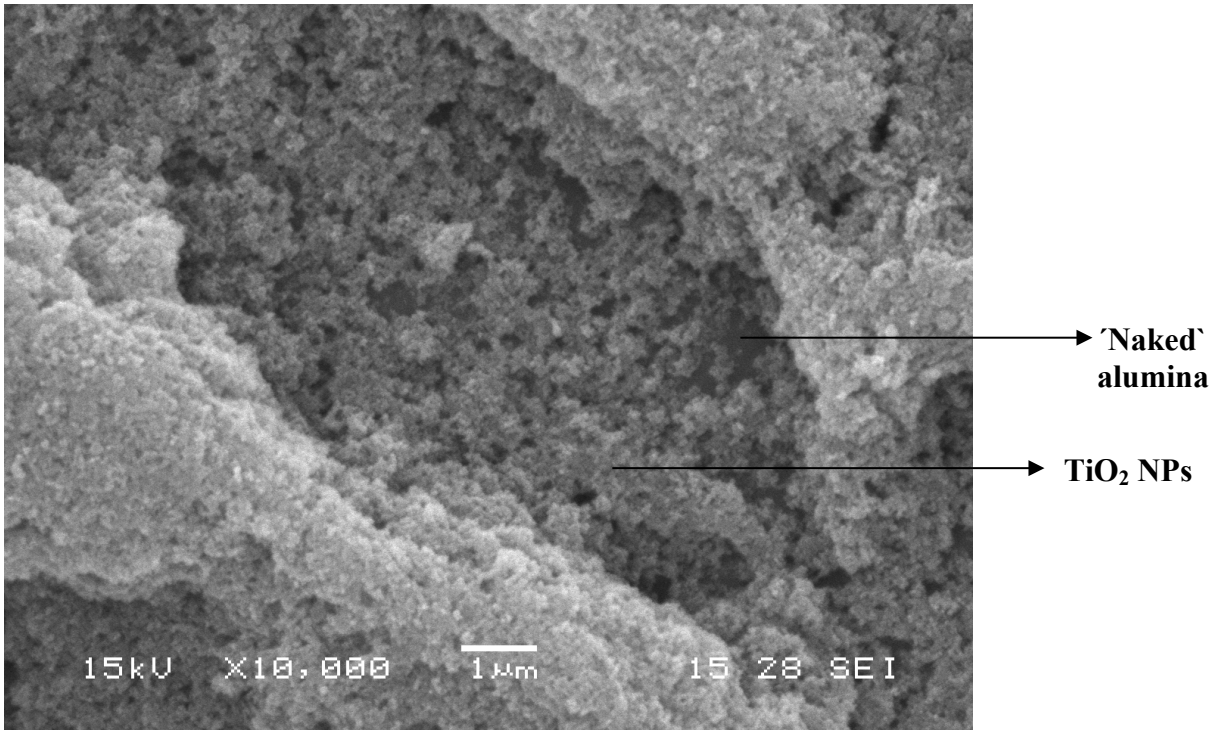

Figure S4: Detail of the surface seen between ridges in sample 5-TiO_2. It is composed of TiO_2 nanoparticles (although a ´naked` alumina surface may be also identified) but less interconnected compared to the joining bridges.

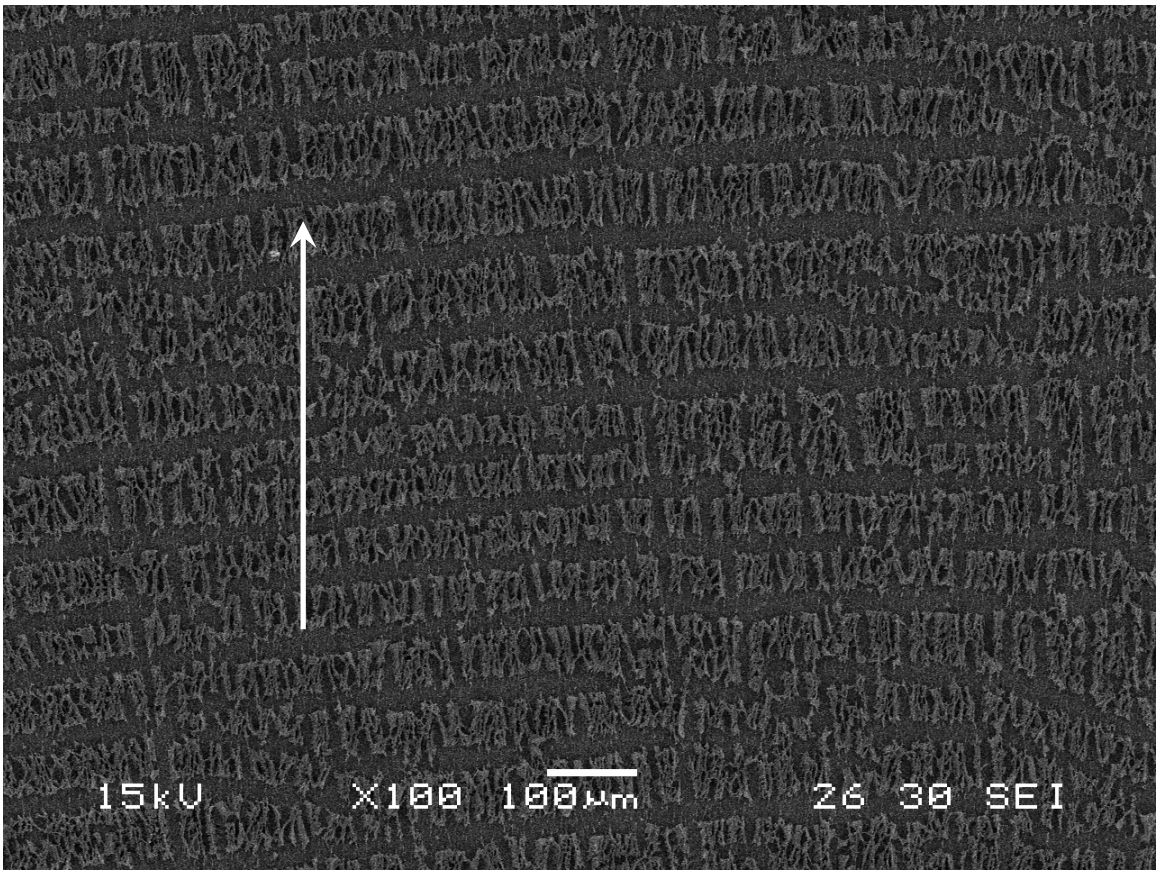

Figure S5a: 1-TiO_2 film, sintered at 1000 ºC for 1.5 h. Highly oriented parallel patterns, this time extending perpendicularly to the freezing direction, were observed. Arrow indicates the temperature gradient direction.

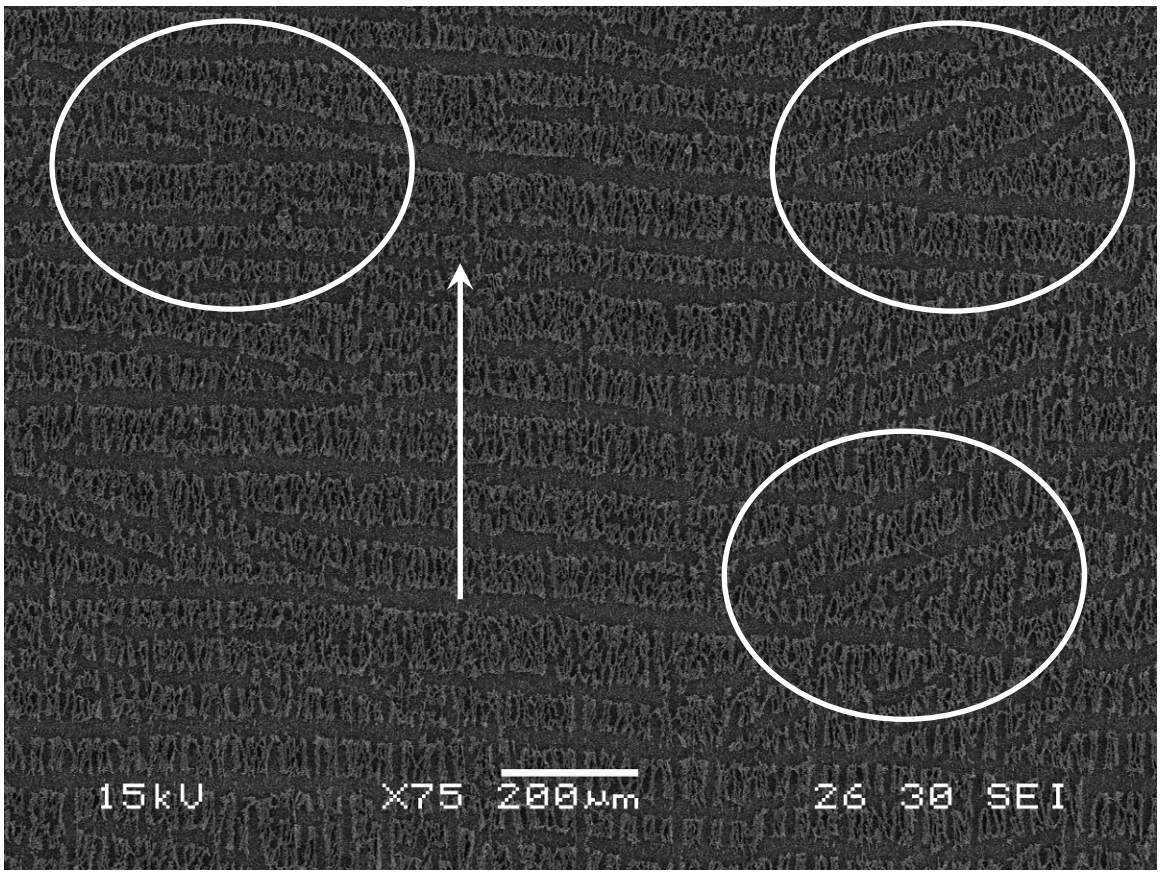

Figure S5b: 1-TiO_2 film, sintered at 1000 ºC for 1.5 h. Tilted grooves (at about 45º with respect to the freezing direction) were observed. This effect can be associated with a change of temperature gradient orientation during the freezing process due to nitrogen vapour fluctuations. Arrow indicates the temperature gradient direction. Ellipses show tilted features.

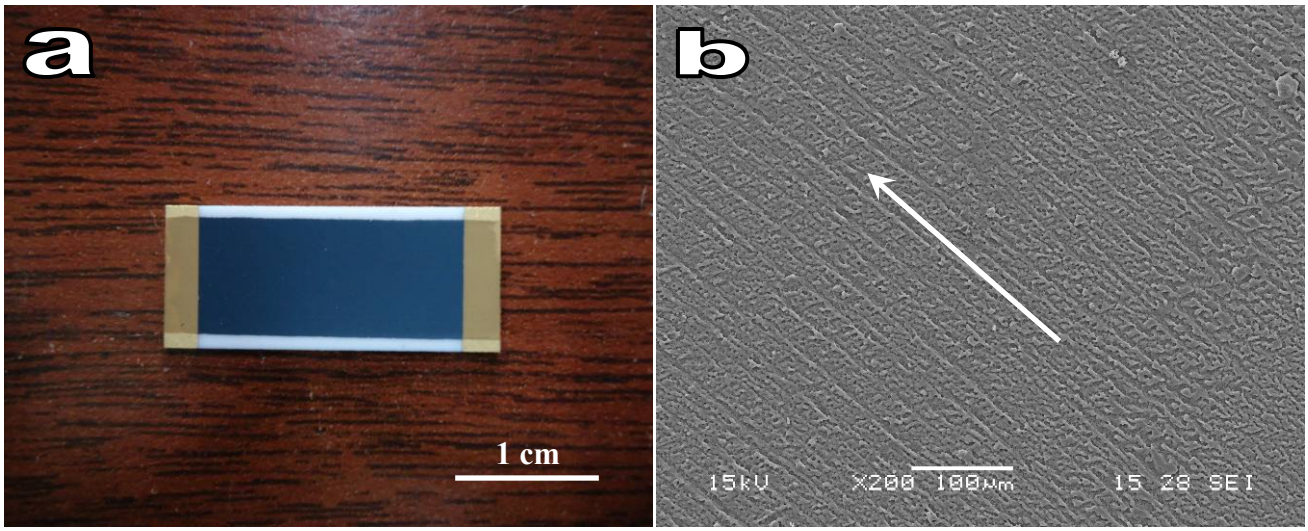

Figure S6: (a) Photograph of 5-TiO_2 film after the reducing treatment at 1000 ºC for 3 h under H_2/Ar atmosphere. **(b)** Highly oriented patterns, extending throughout the whole surface, were observed after the reducing process. Arrow indicates the freezing direction.